

Multi-source screening and multi-receptor screening

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- What is multi-source screening?
- What does it mean to model receptors in a polar or Cartesian grid with screening?

270 → U

Cartesian coordinates

100,200

150,200



100,150

150,100

In refined mode, relative x and y-coordinates calculated between source and receptor based on wind direction

270 → U

Relative coordinates

0,50

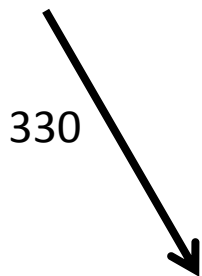
50,50



0,0

50,-50

In refined mode, relative x and y-coordinates calculated between source and receptor based on wind direction



330

U

Cartesian coordinates



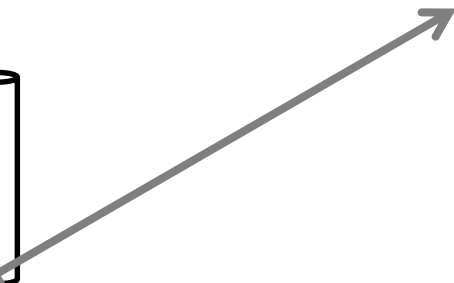
100,200



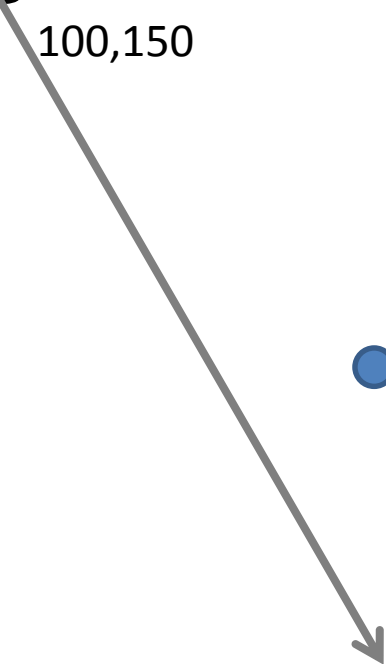
150,200



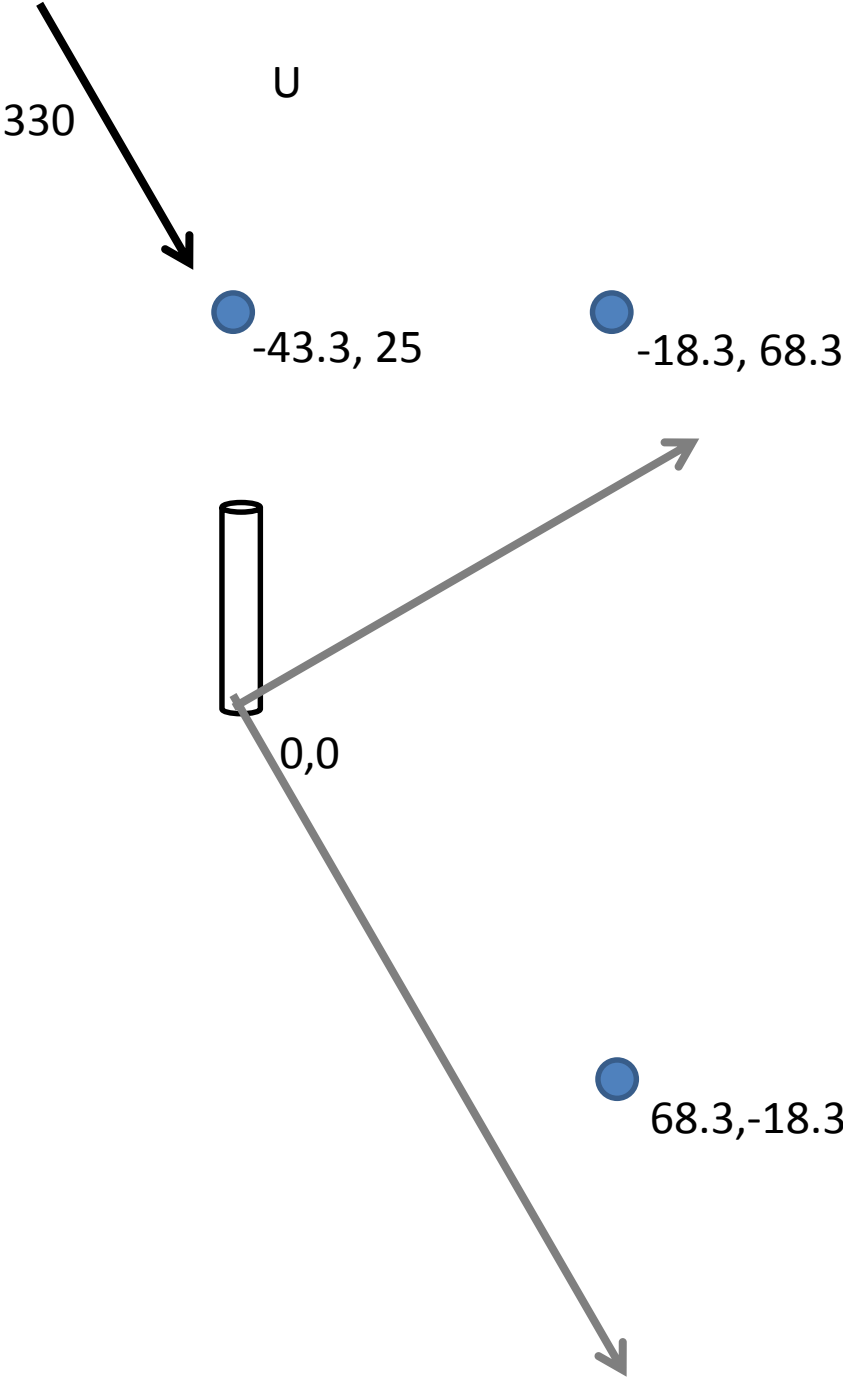
100,150



150,100



Relative coordinates



270 → U

Cartesian coordinates
Relative coordinates

100,200

150,200



100,150
0,0

50,0 70.7,0

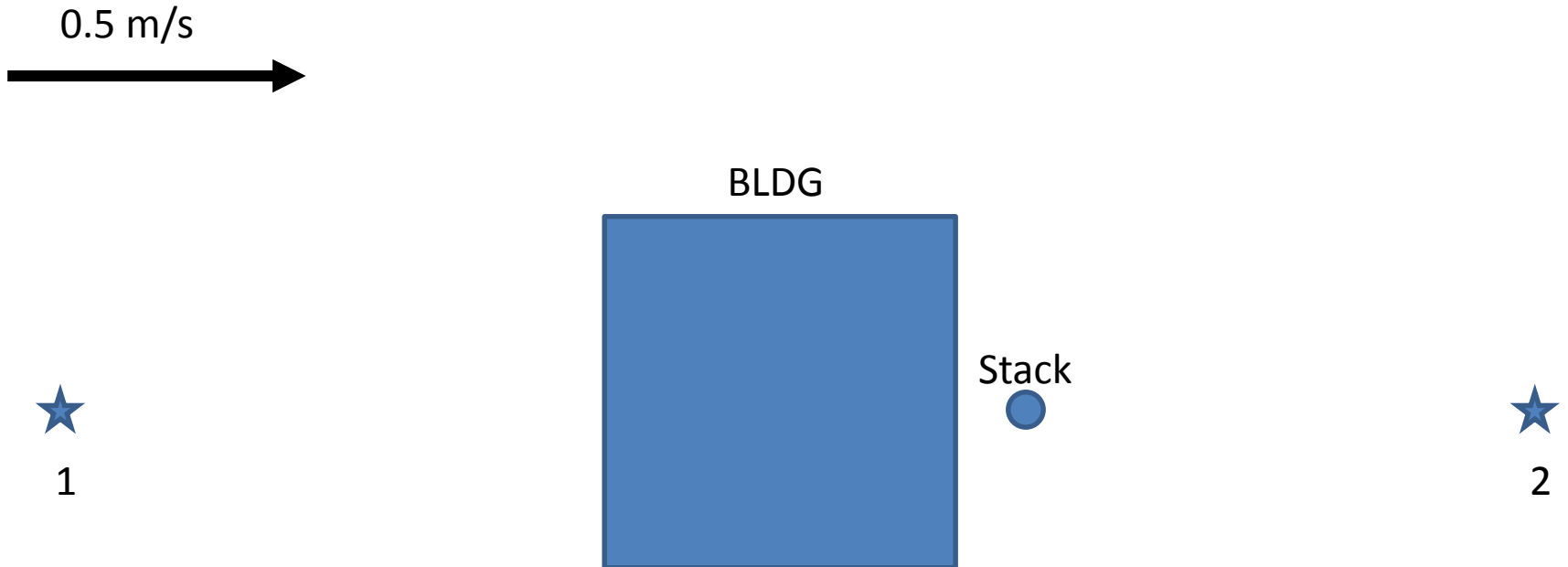
150,100

In screening mode, relative x and y-coordinates calculated as x = distance between source and receptor and y=0 (plume centerline)

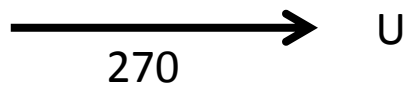
Downwash

- If running AERMOD in screening mode with multi-directional receptors, care must be taken with downwash
- For a given hour, wind direction determines the appropriate downwash parameters
- Since screening mode “ignores” direction in receptor placement, this can have unanticipated effects

Downwash



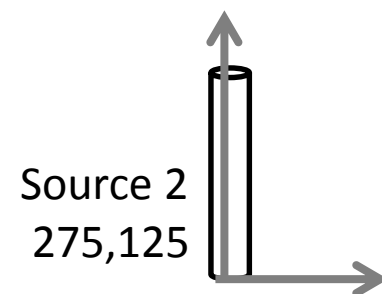
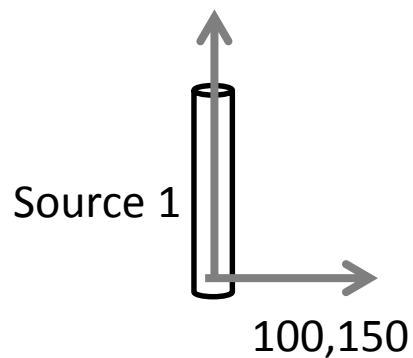
Run	Receptor 1	Receptor 2
Non-screening	127 ($\mu\text{g}/\text{m}^3$)	596 ($\mu\text{g}/\text{m}^3$)
Screening	596 ($\mu\text{g}/\text{m}^3$)	596 ($\mu\text{g}/\text{m}^3$)



Cartesian coordinates

100,200

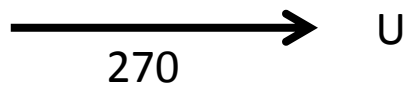
150,200



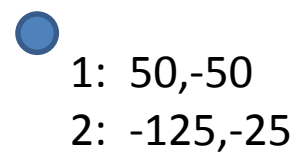
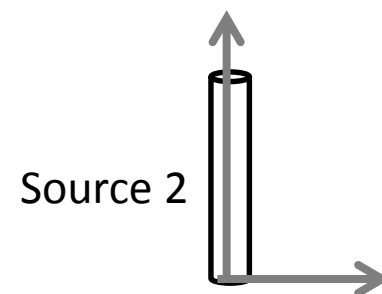
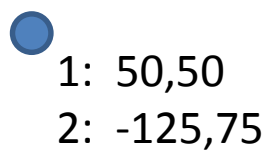
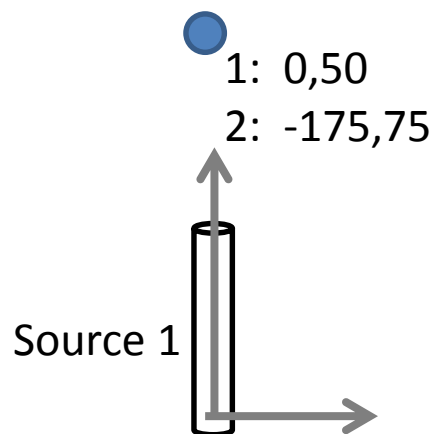
150,100

Two sources

Refined mode



Relative coordinates



Refined mode

270 U

Cartesian coordinates

R1
100,200

R2
150,200

Source 1
100,150

Source 2
275,125

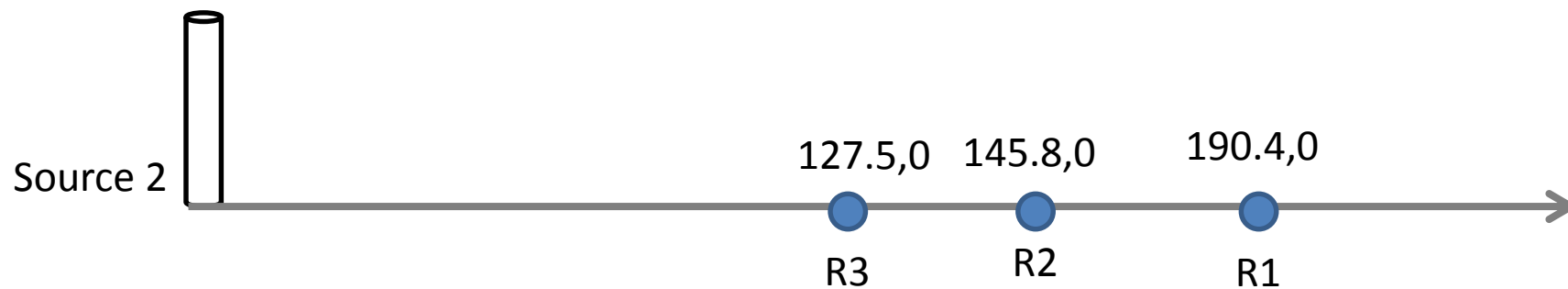
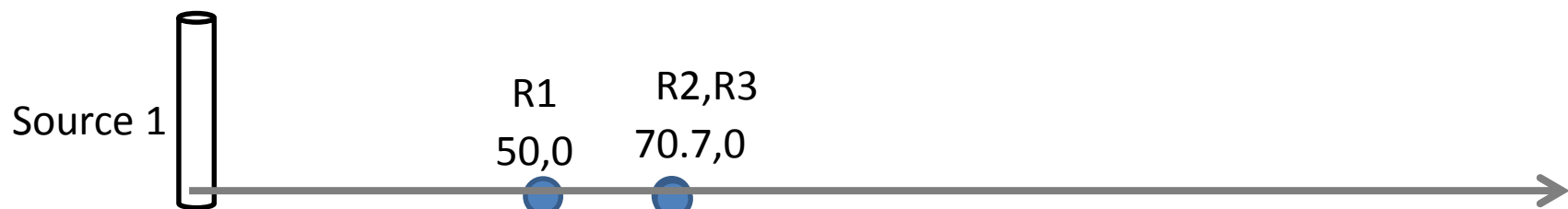
R3
150,100

Two sources

Screening mode

270 → U

Relative coordinates



Two sources

Screening mode

- In screening mode, the spatial orientation of receptors and sources no longer maintained, only distance matters.
- Does this make physical sense with multiple sources or multiple receptors?

Scenarios

- Modeled five identical sources for 1 hour, wind direction from west
 - $H=10$ m
 - $T=300$ K
 - $V=15$ m/s
 - $D=0.5$ m
 - $E=1$ g/s
- Flat terrain, no downwash, no spatially varying SC
- Screening vs. non-screening

Legend

★
STACK1


★
STACK2

★
STACK3

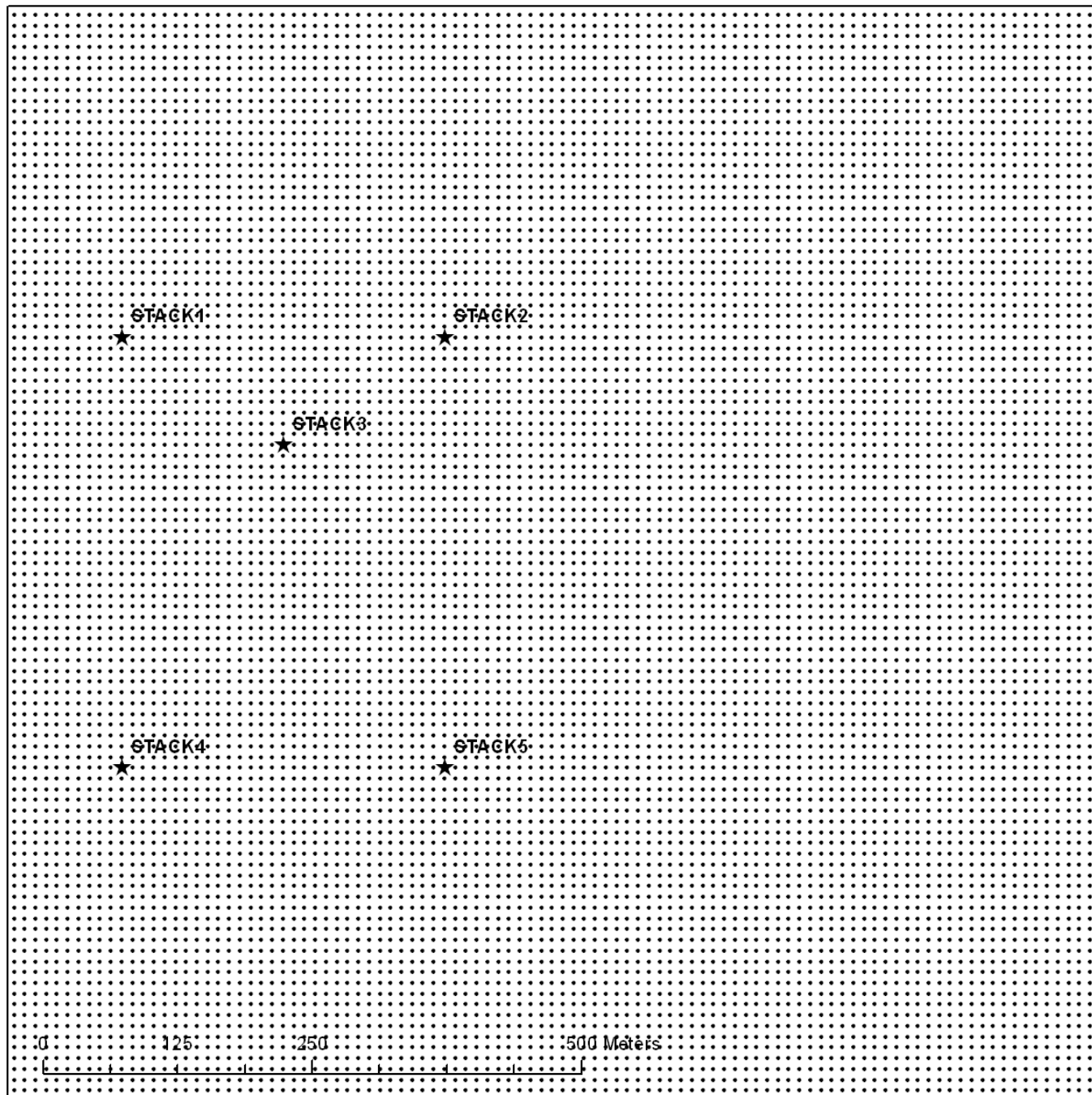
★
STACK4

★
STACK5

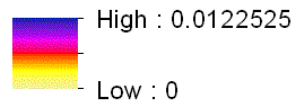
0 125 250 500 Meters



Legend

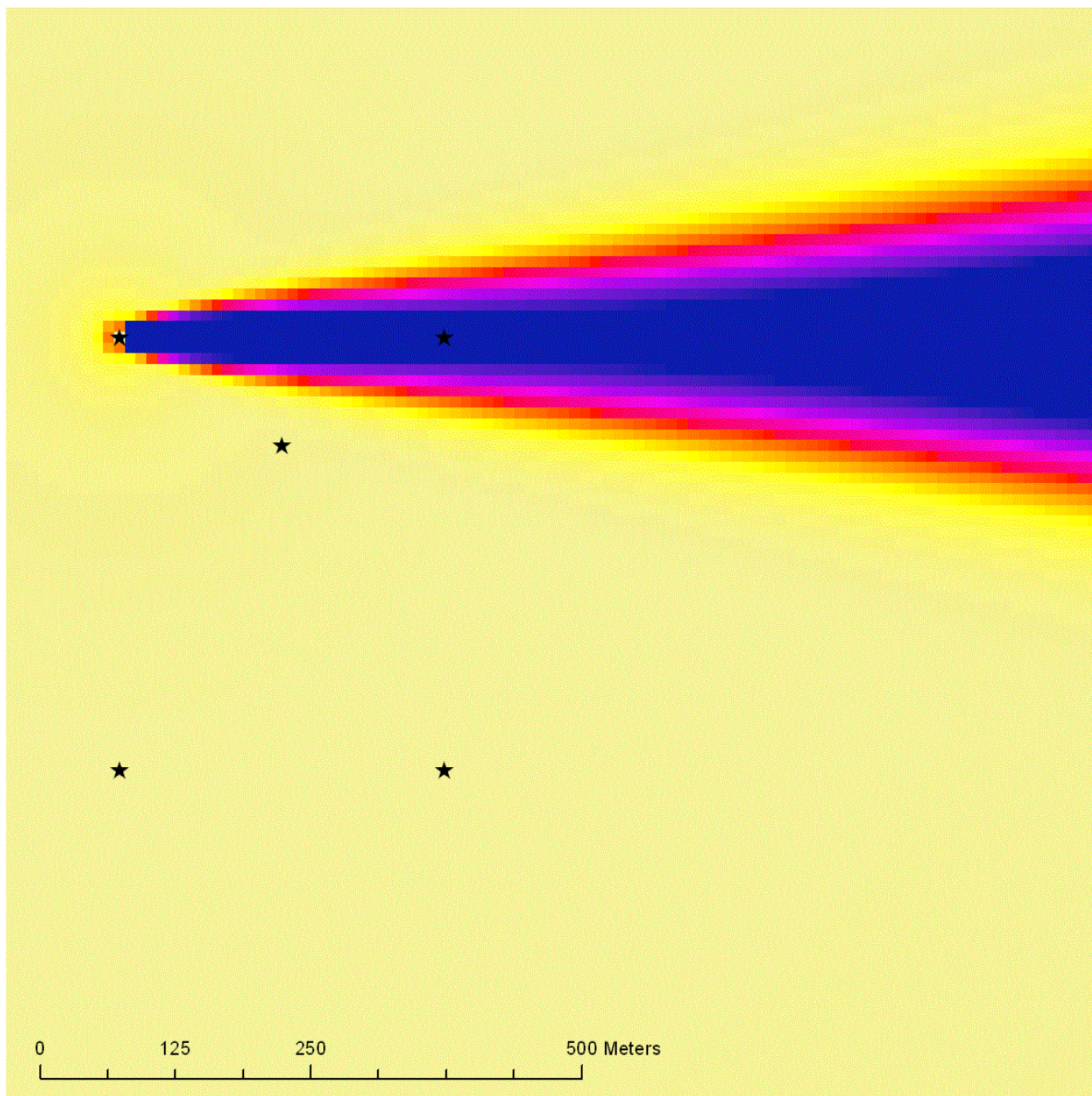


Legend

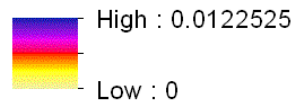


0.5 m/s

STACK1
NO SCREEN

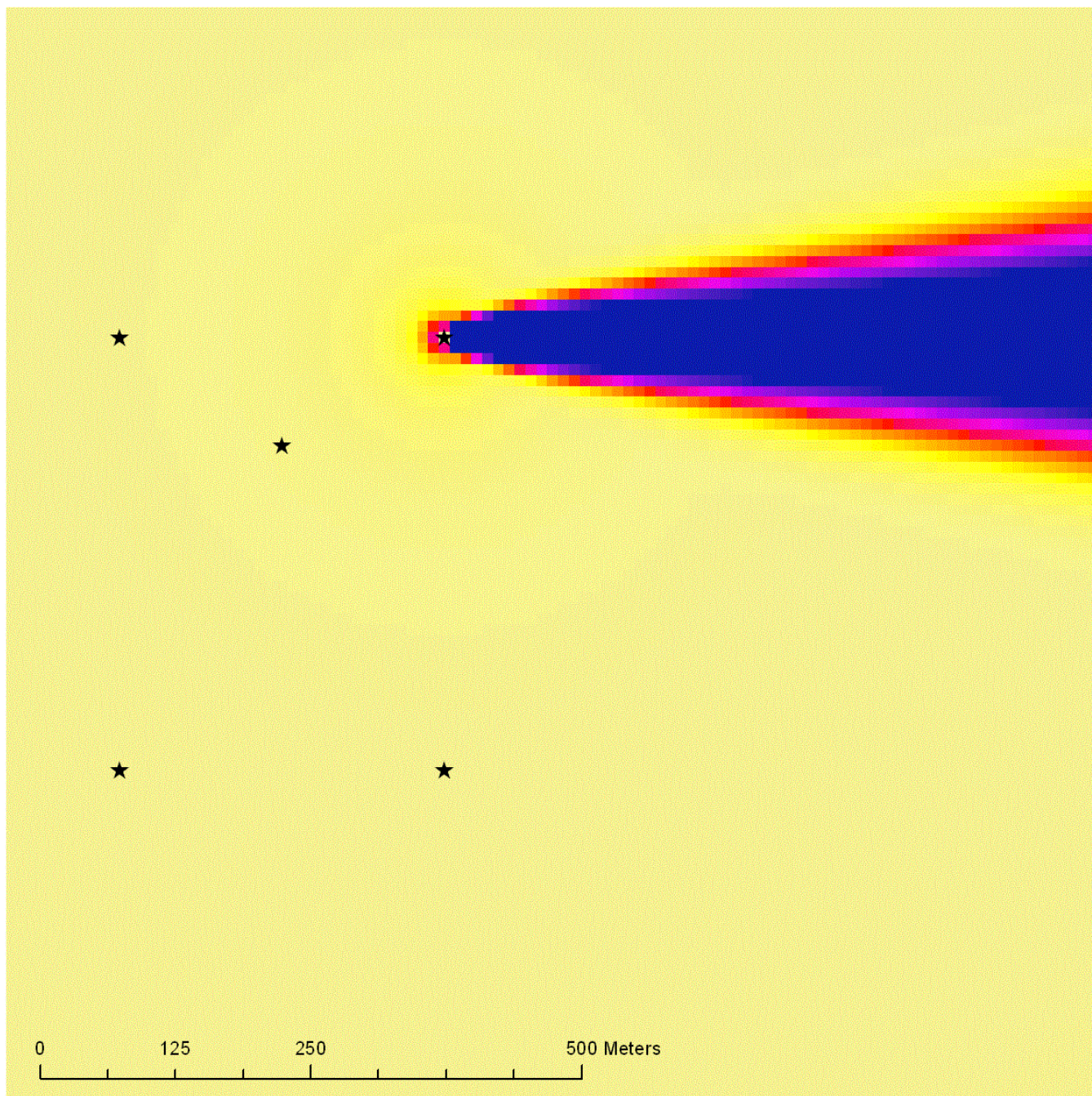


Legend

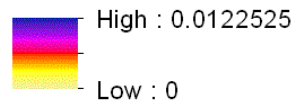


0.5 m/s

STACK2
NO SCREEN

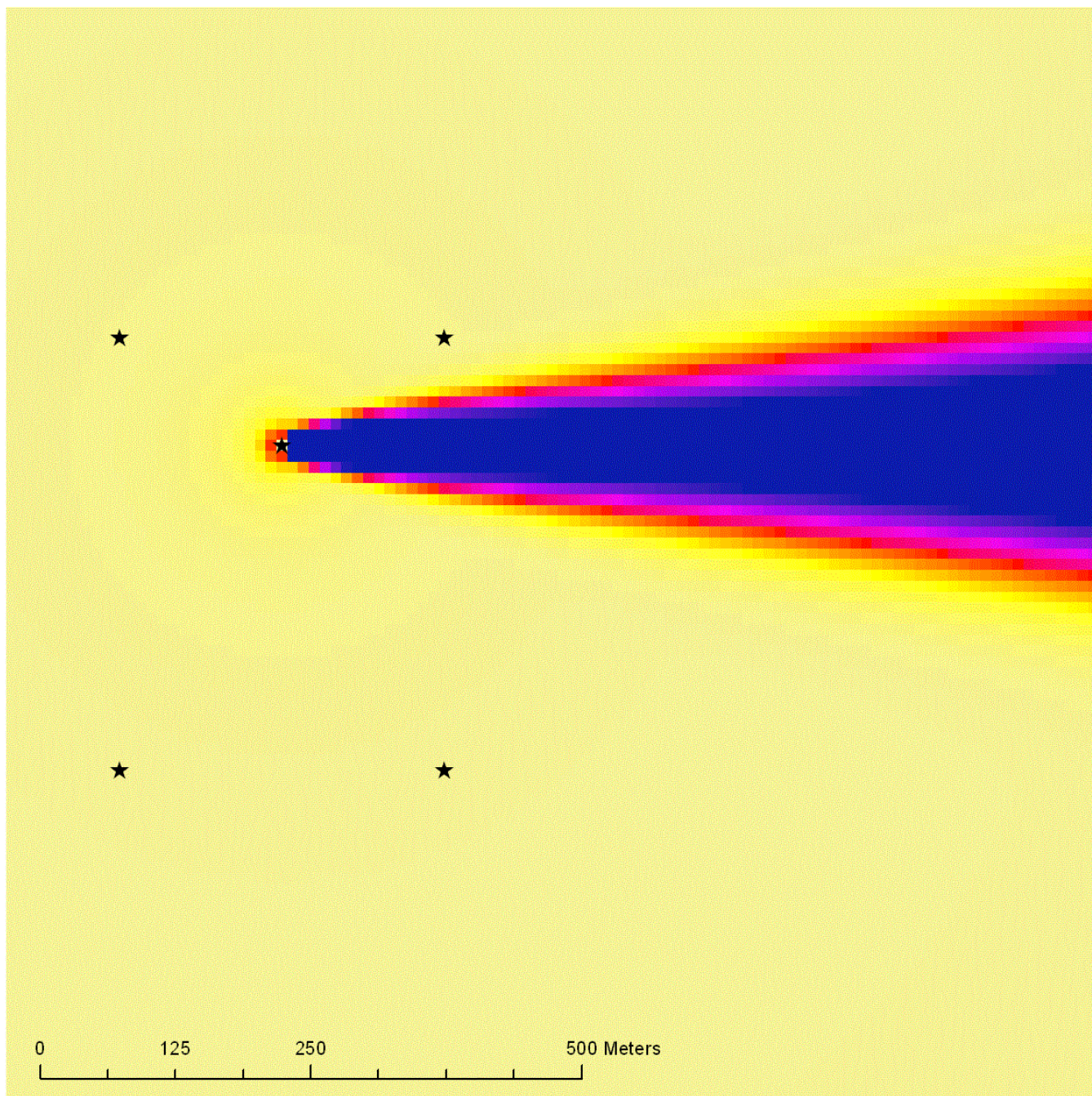


Legend

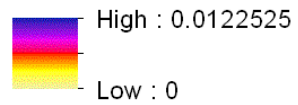


0.5 m/s

STACK3
NO SCREEN

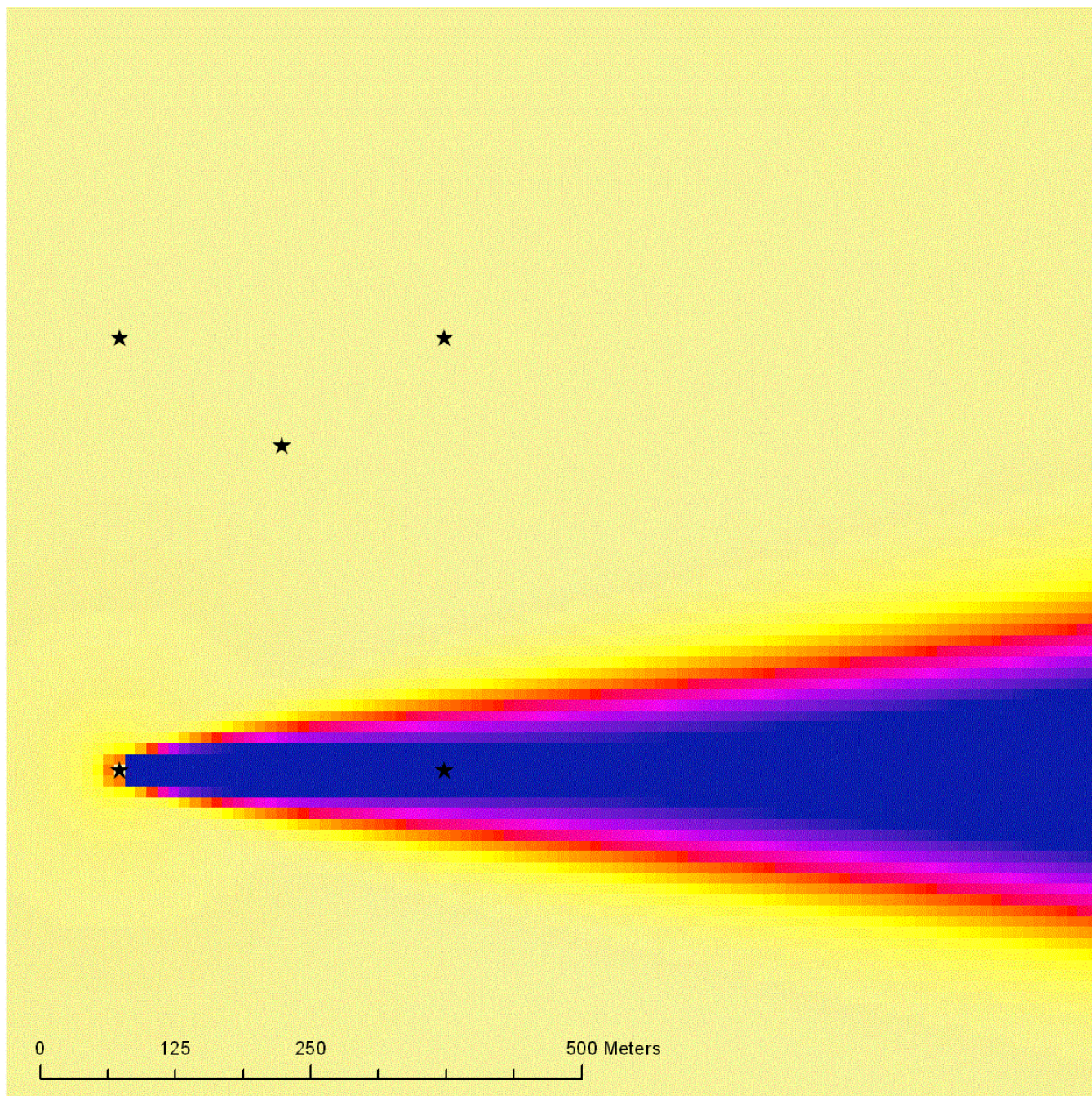


Legend

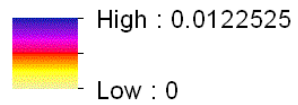


0.5 m/s

STACK4
NO SCREEN

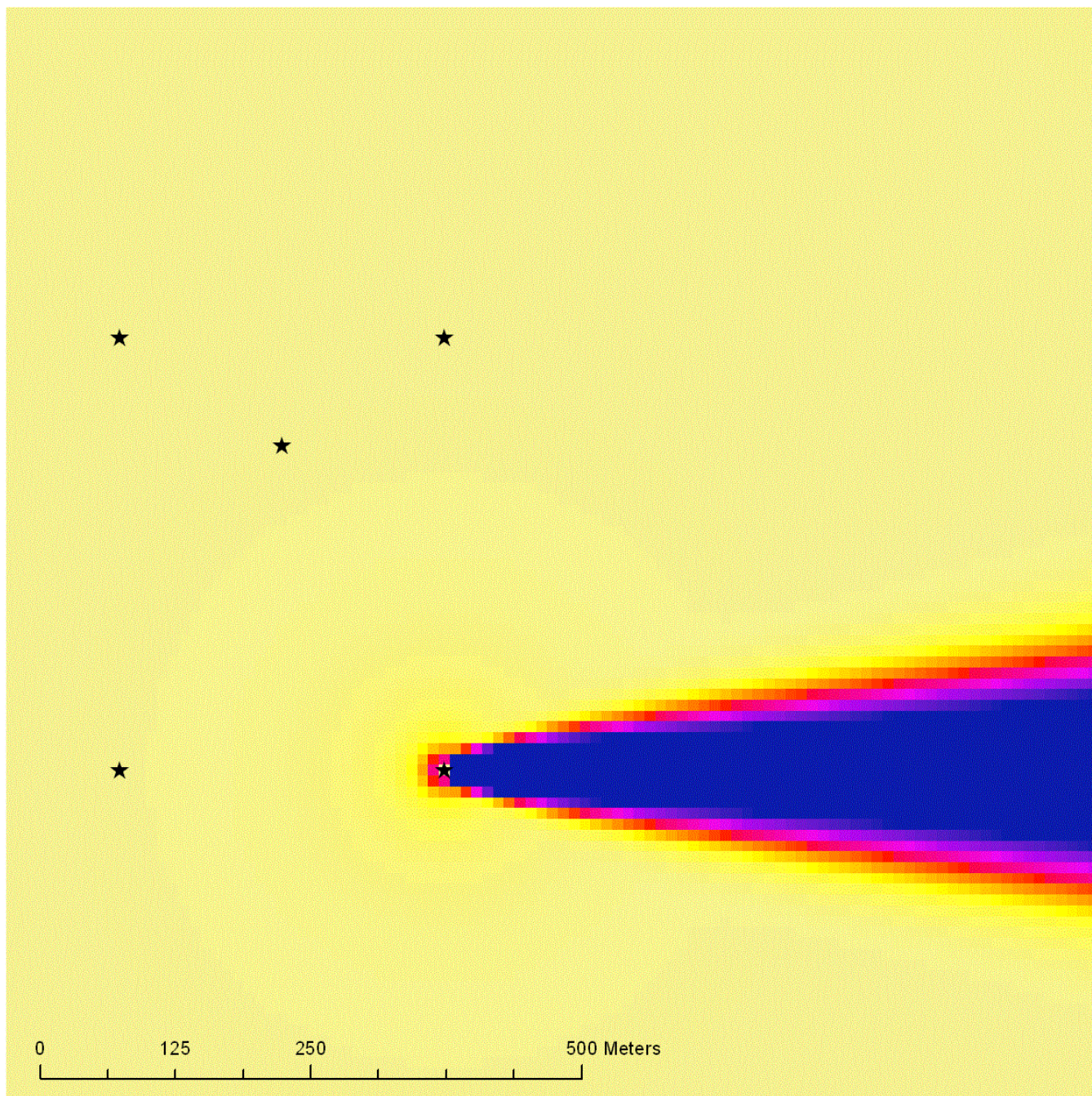


Legend

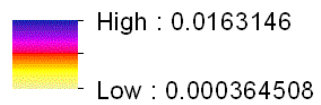


0.5 m/s

STACK5
NO SCREEN

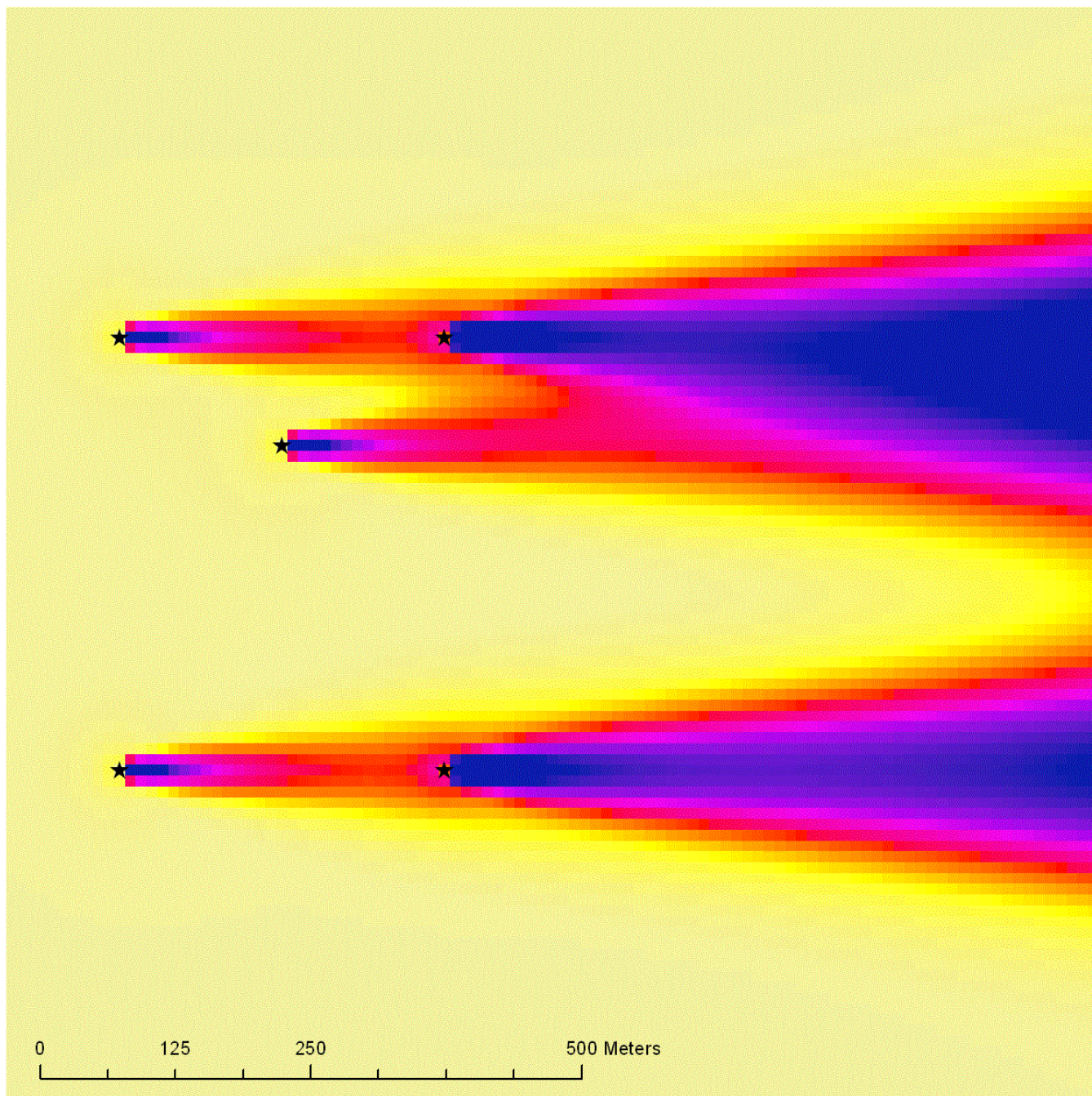


Legend

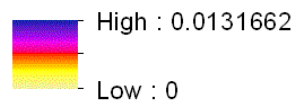


0.5 m/s

ALL
NO SCREEN

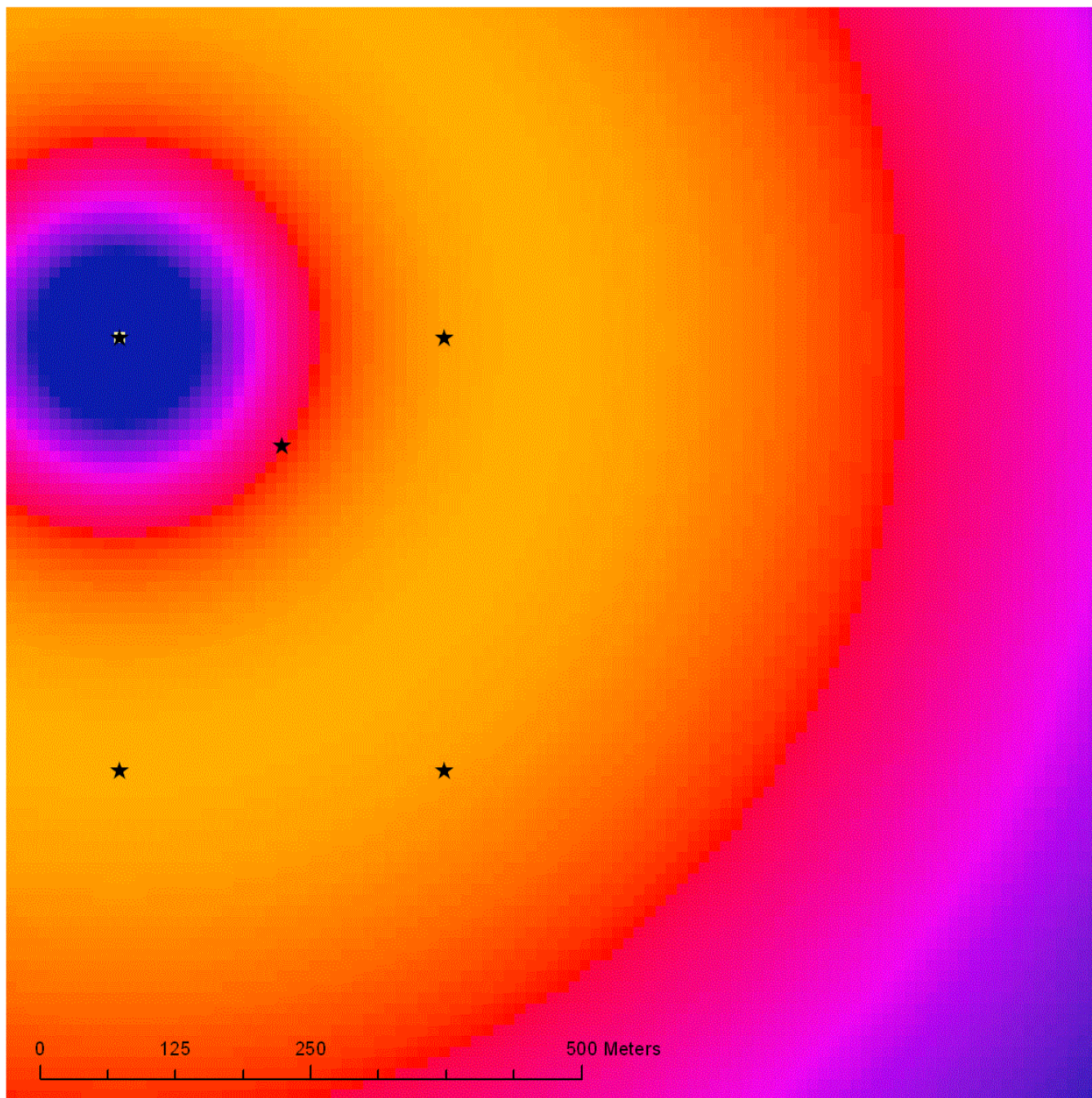


Legend

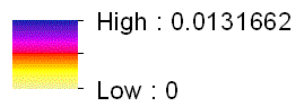


0.5 m/s

STACK1
SCREEN

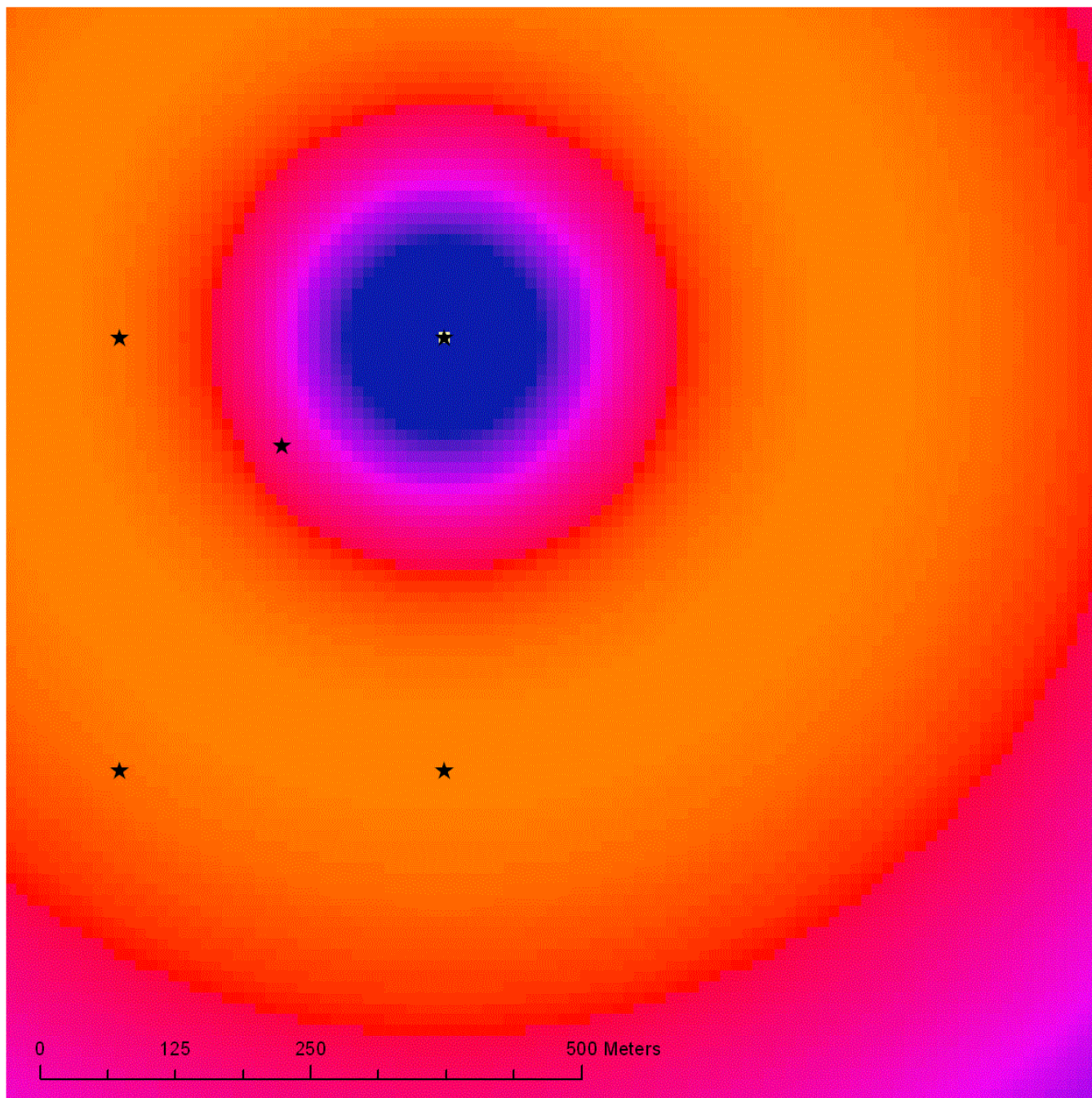


Legend

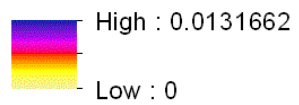


0.5 m/s

STACK2
SCREEN

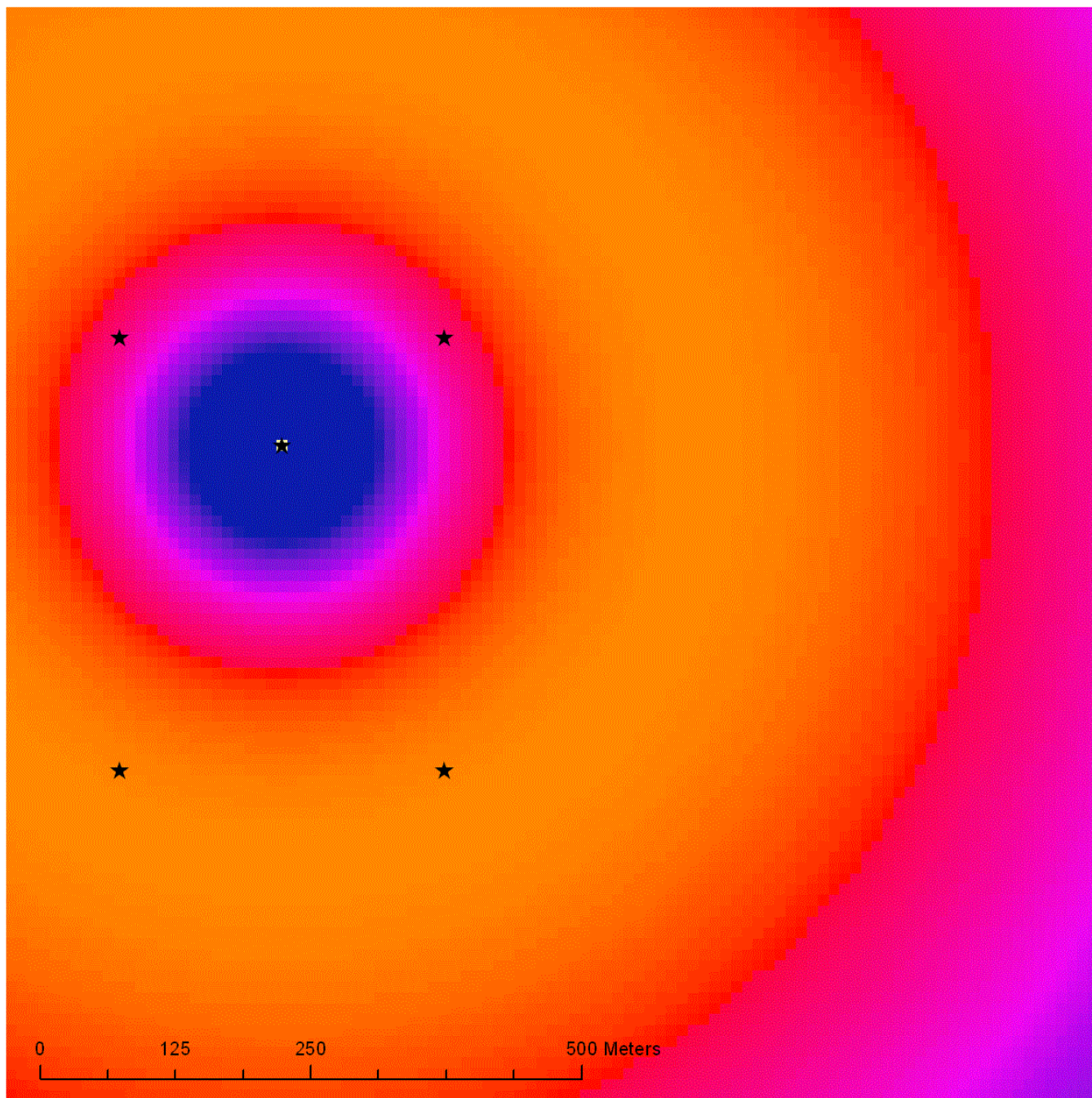


Legend

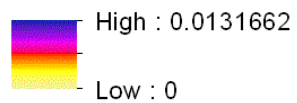


0.5 m/s

STACK3
SCREEN

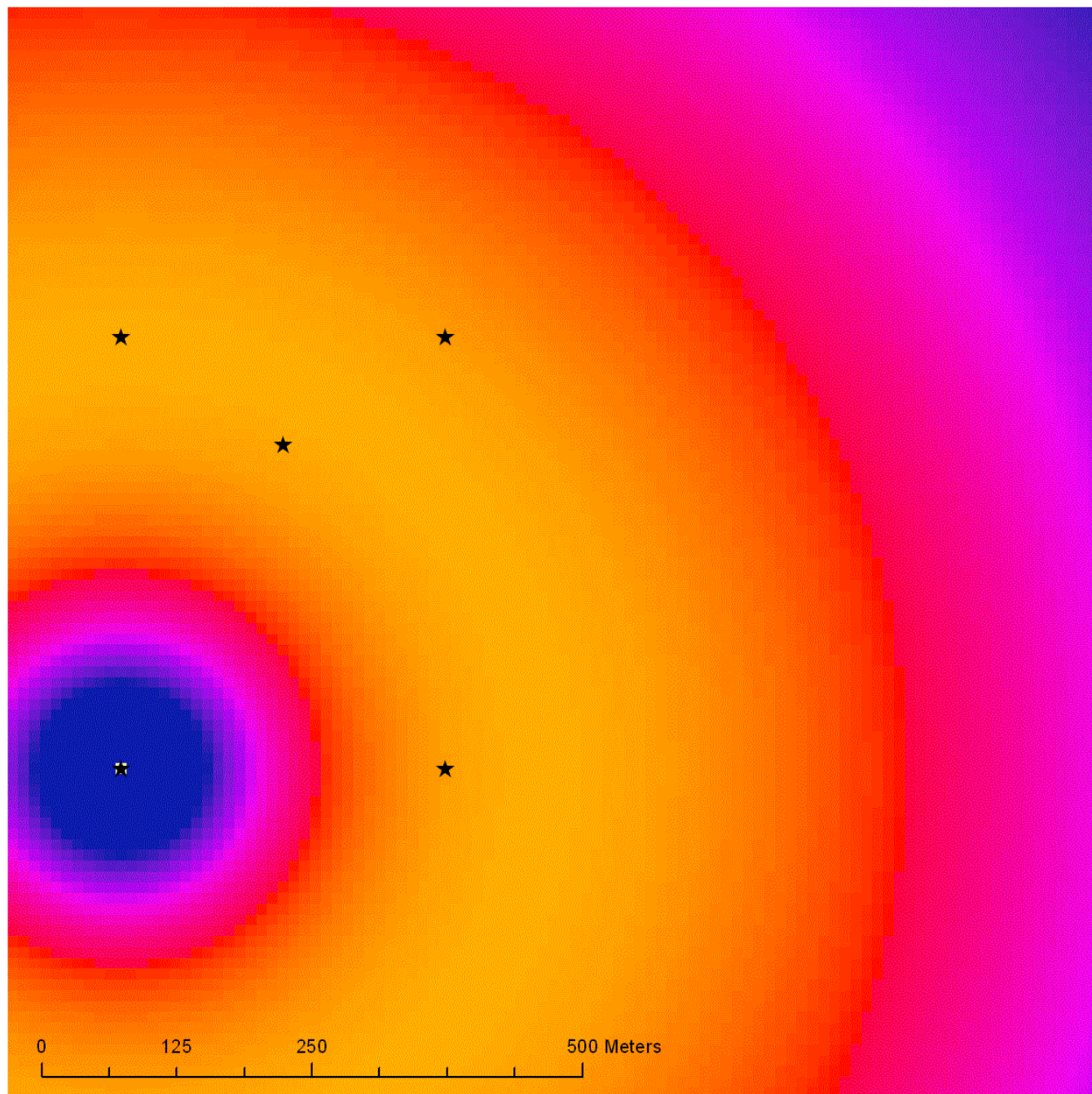


Legend

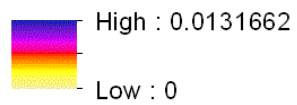


0.5 m/s

STACK4
SCREEN

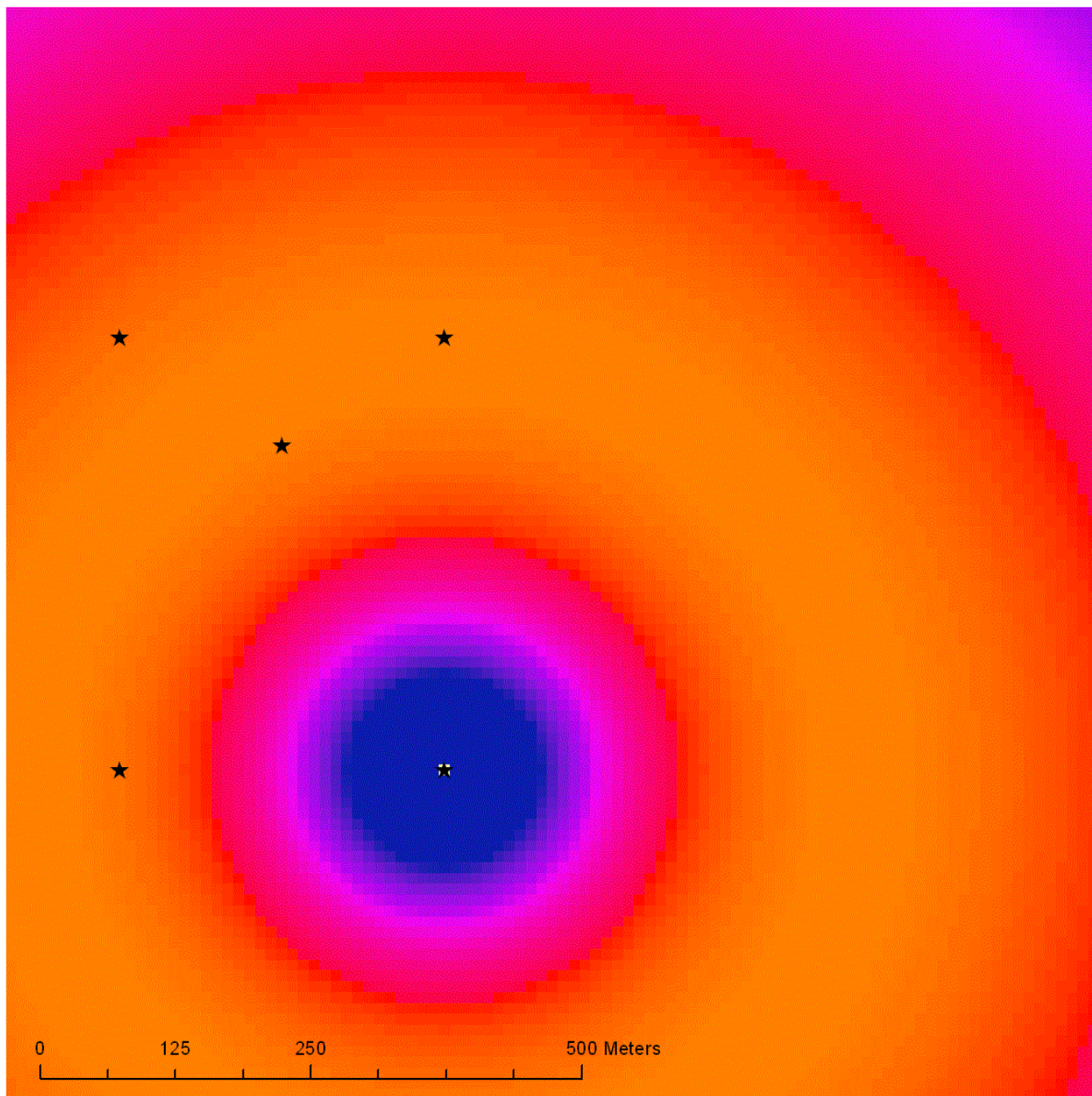


Legend

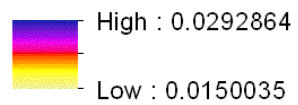


0.5 m/s

STACK5
SCREEN

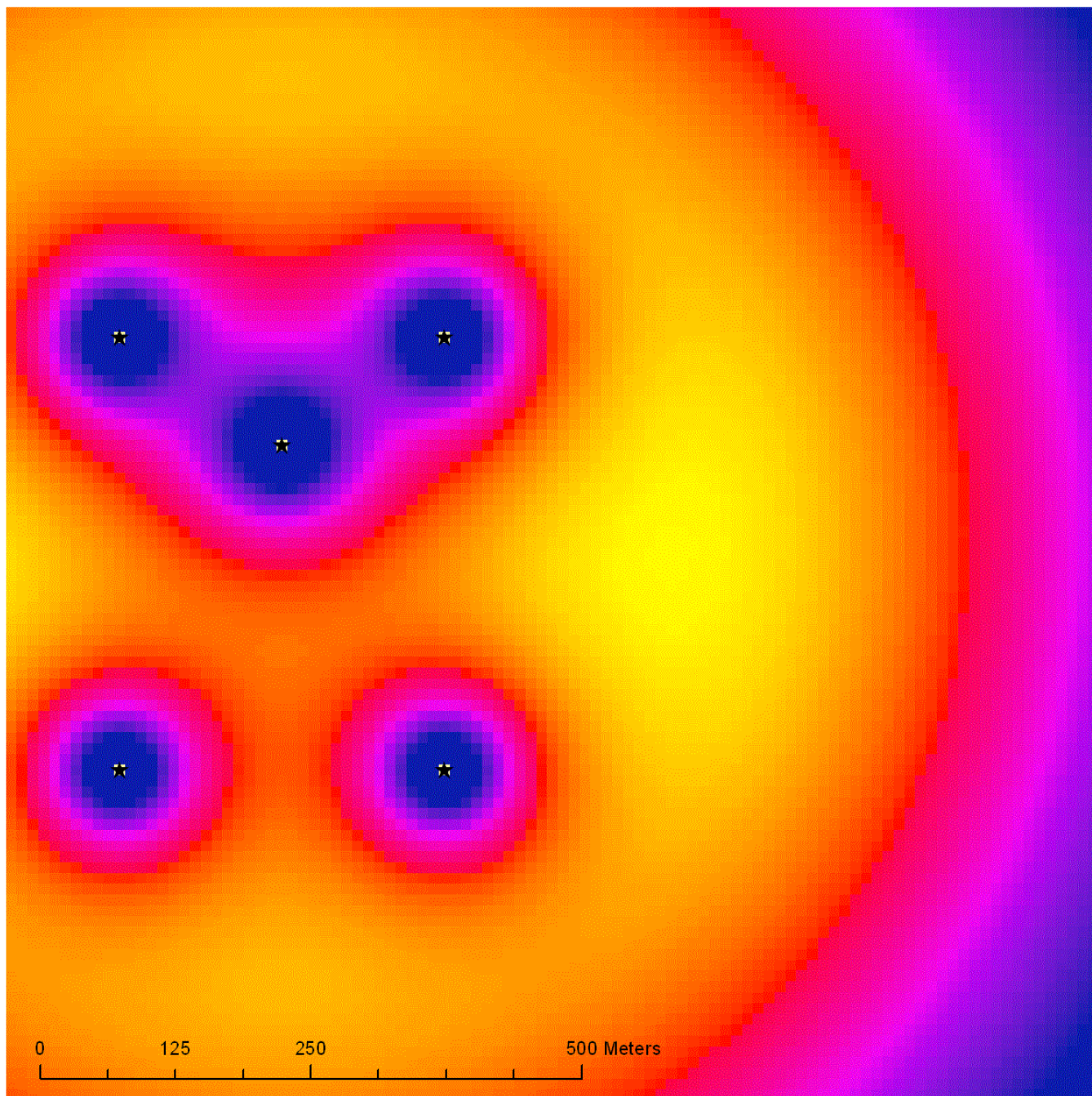


Legend



0.5 m/s

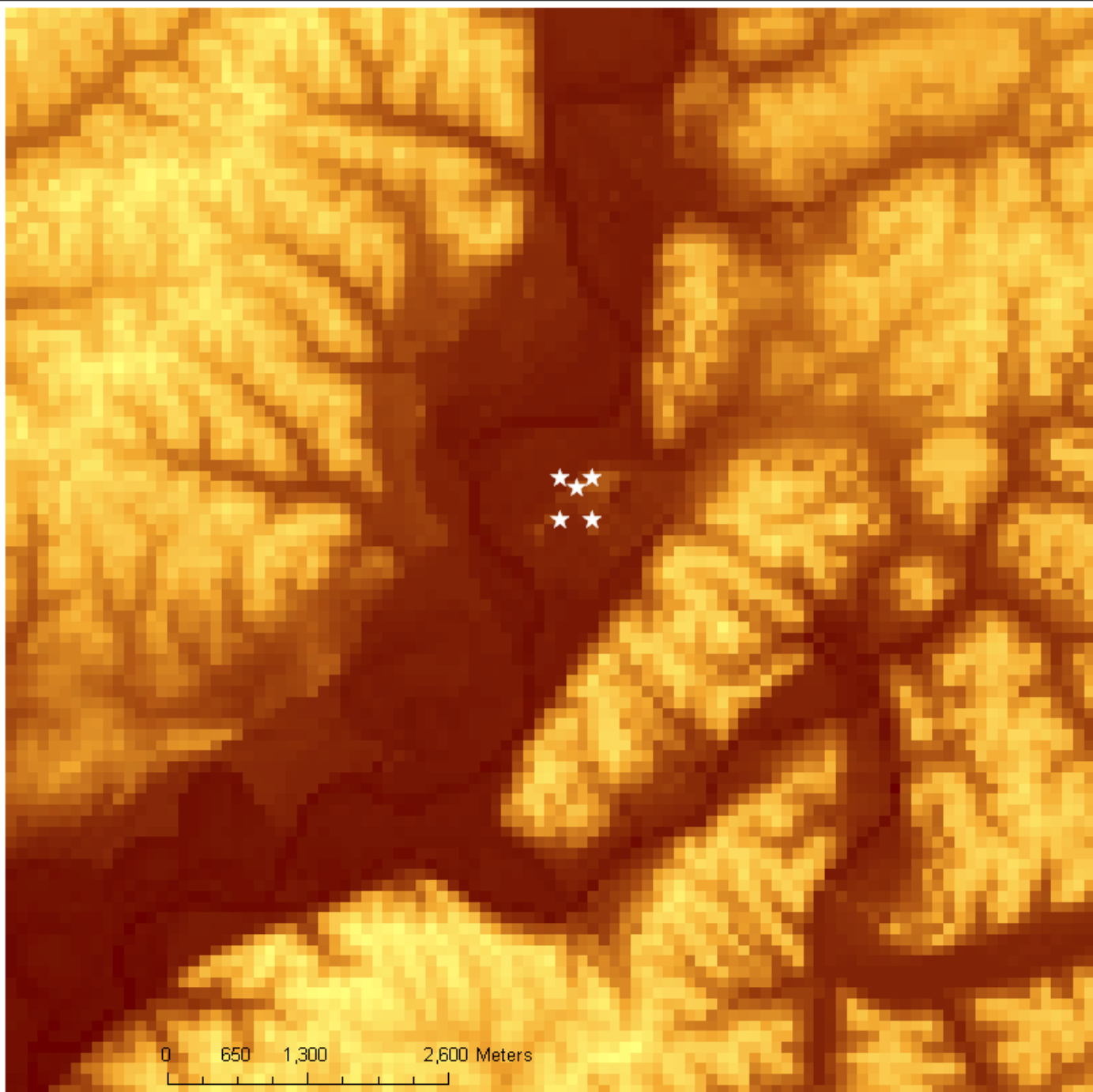
ALL
SCREEN



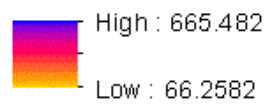
Five sources with terrain

- Same five sources
- 1-year of met data
- Plotted maximum 1-hour concentrations at each receptor

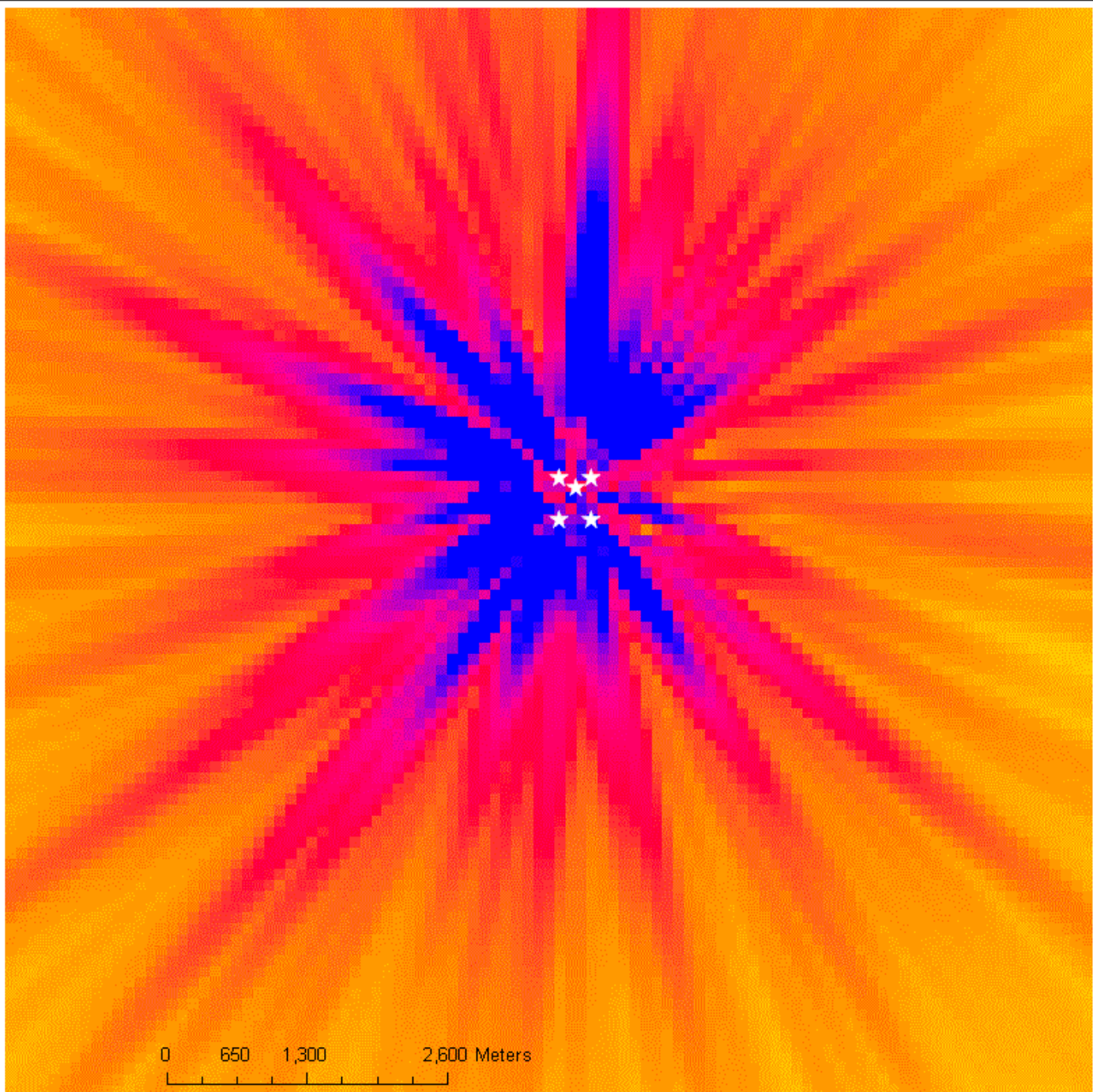
Legend



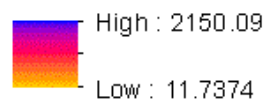
Legend



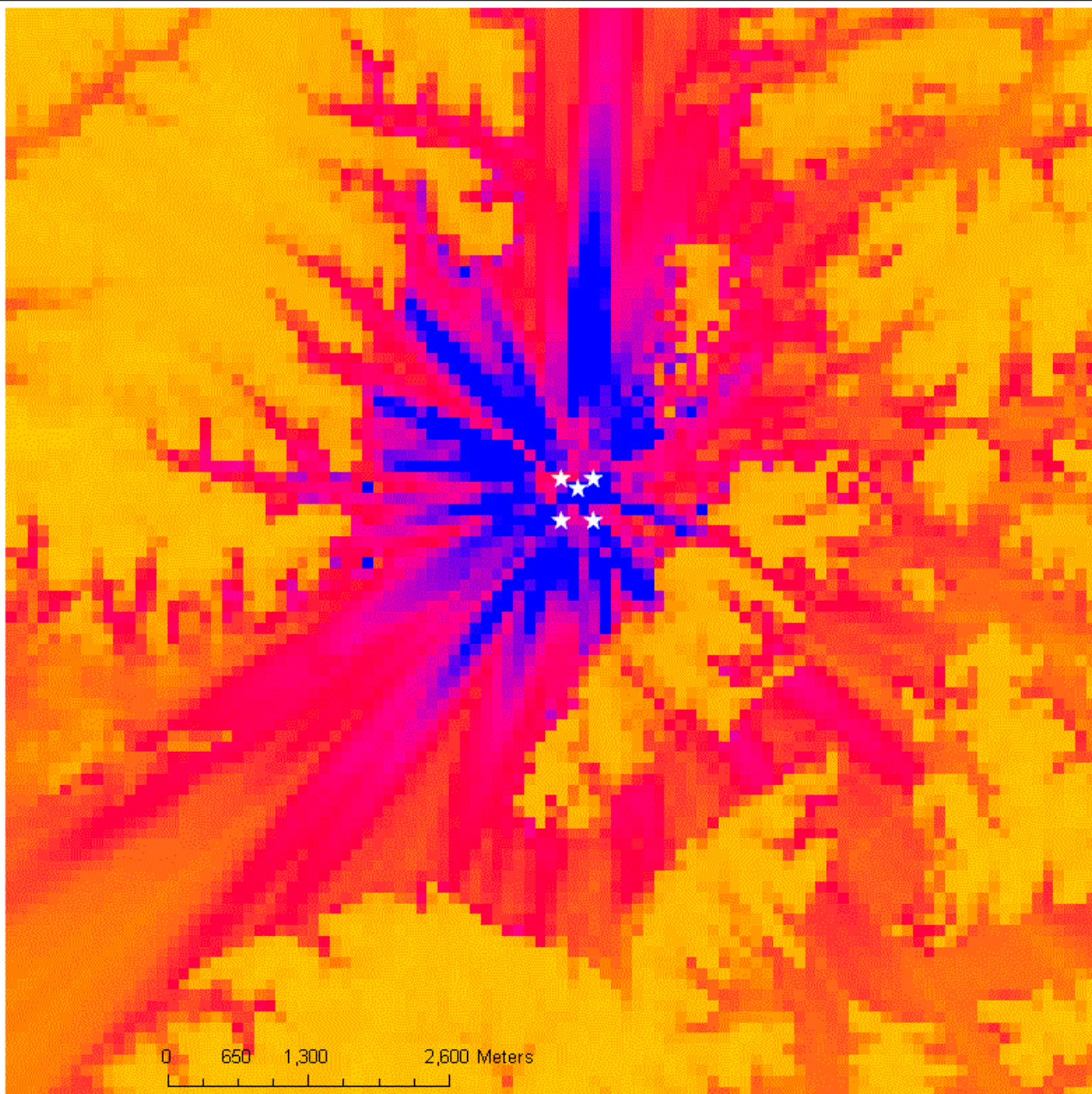
No screen
Flat



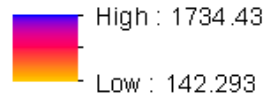
Legend



No screen
terrain



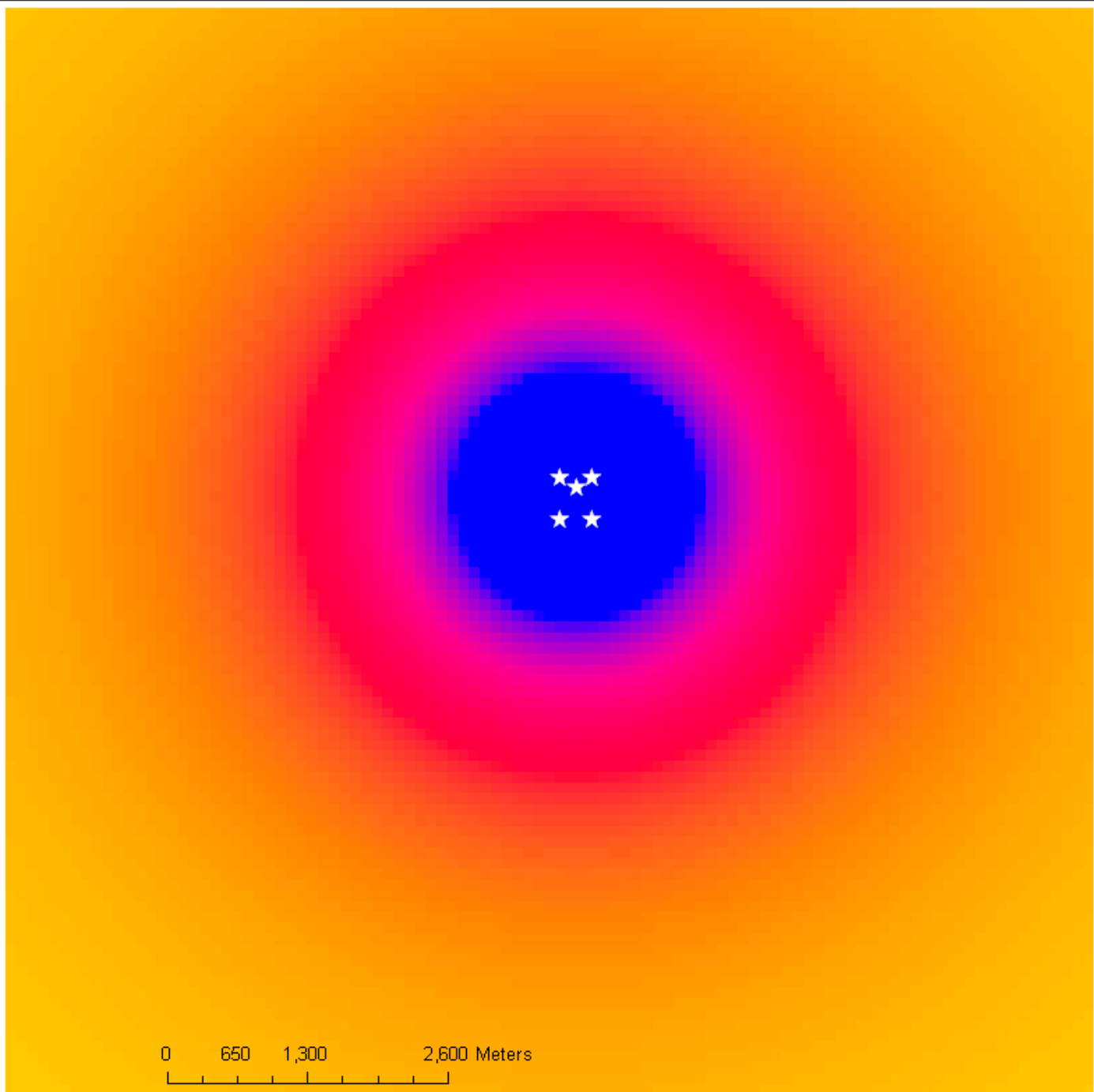
Legend



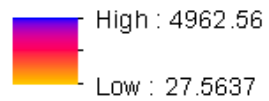
Screen
flat

0 650 1,300 2,600 Meters

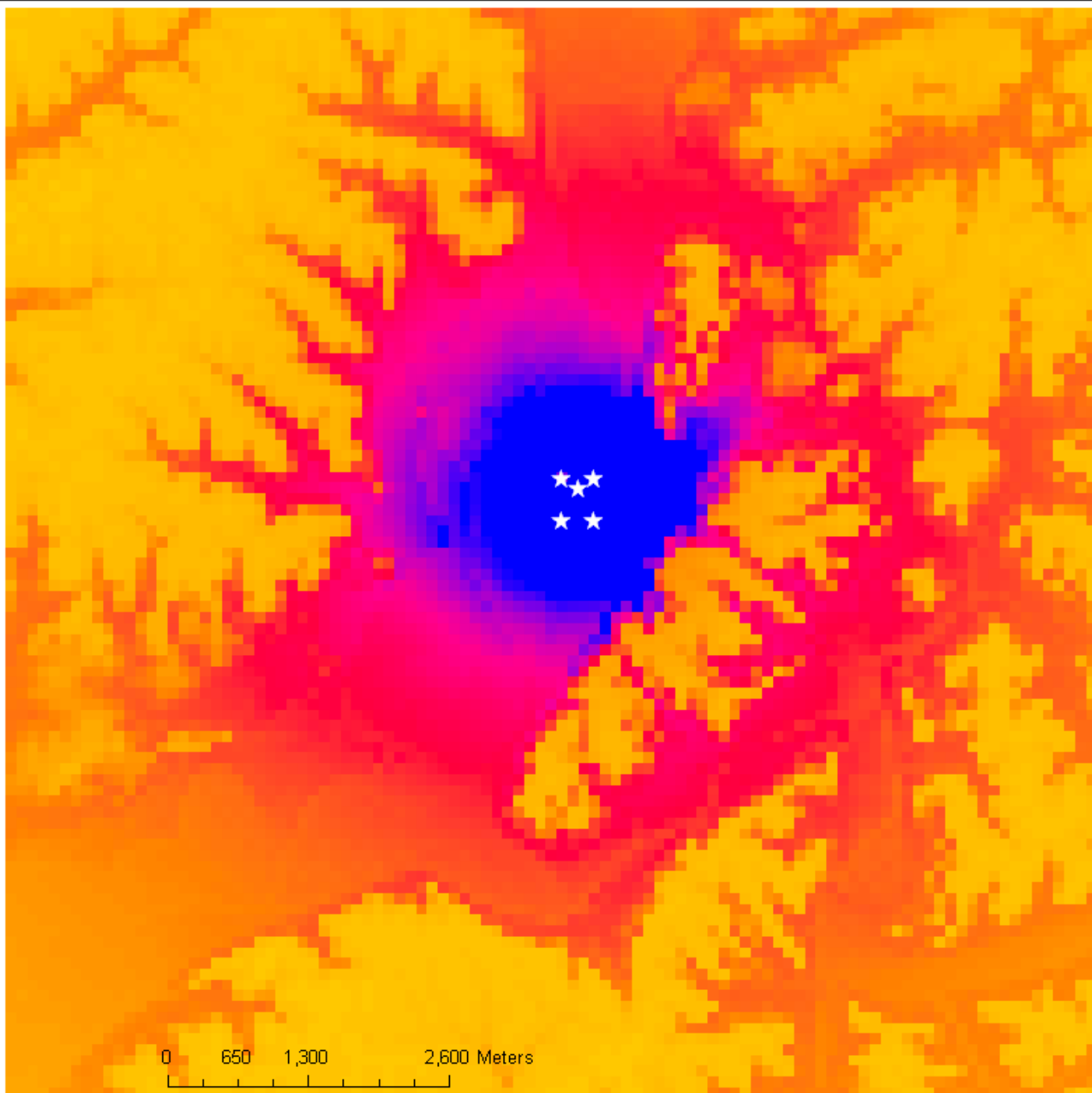
A horizontal scale bar with tick marks at 0, 650, 1,300, and 2,600 meters.



Legend



Screen
terrain



Future work

- Continue evaluations
- Determine feasibility of creating multi-source AERSCREEN